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# EVALUATING THE MEASURES FOR IMPROVING THE IMPLEMENTATION OF SUSTAINABILITY PRACTICES ON BUILDING PROJECTS IN AKWA IBOM STATE, NIGERIA

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## ABSTRACT

With growing concerns for the environment due to the effects of climate change, there has been a focus on the way construction activities are being carried out; especially in the use of energy and resources. Implementation of sustainable construction in the lifecycle of any construction project, particularly during the construction phase, would reduce the effects of climate change and damage done to the environment. As such, the purpose of this study was to evaluate measures of improving the implementation of sustainability practices during the construction phase of building projects. The study made use of mixed method of research approach. This entails collecting both quantitative and qualitative data through the use of questionnaires and interview respectively. The structured questionnaire was administered to 383 respondents using stratified random sampling approach resulting in 80 valid responses. Also, ten seasoned professionals, purposively selected, were interviewed from three building construction projects as a case study. Findings from the questionnaire survey suggests that “education and training programs for building professionals”, “competence and teamwork of professionals”, and “government regulations” were rated as the first, second, and third best measures needed to improve the implementation of sustainability practices during the construction phase of building projects respectively. Also, findings from the interview shows that sustainability practices need to be embedded in the conditions of contracts and provide a system to adequately vet the design and materials specification for sustainable construction during construction phase of building projects. The study concluded that implementing these findings would improve the implementation of sustainability practices during construction phase of building projects in the study area. It is recommended that improving the knowledge of building professionals as well as stringent regulations on sustainability by the government through adequate enforcement would improve the implementation of sustainability practices on building construction projects.

**Keywords:** Sustainability practices; building projects; Akwa – Ibom State; Nigeria.

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## INTRODUCTION

With growing concerns for the environment and climate change, there has been a focus on the way new buildings are commissioned and built; particularly in their use of energy and resources. Construction activity is commonly considered to have adverse impacts on the environment (Shen, Wu and Wang, 2001), which is the basis of sustainable development for humans. This is as a result of the fact that during construction activities, large quantities of natural resources are consumed, water is used extensively, much waste is generated, greenhouse gases are emitted and a wide range of ecosystem is destroyed (Lafarge, 2015). Buildings account for serious CO<sub>2</sub> emissions and consume huge amounts of energy across a lifecycle that spans production, construction, operation and demolition (Olonade, 2015).

Traditional practices of construction process and management have been unable to control unprecedented challenges including the carbon emission by buildings which have contributed to global warming and extreme weather change all over the world (Hussin *et al.* 2013). With



recent climatic change from global warming becoming more adverse worldwide, discussions by the international community for establishing an appropriate response policy against climate change have become more urgent (Tae and Shin, 2009). Many studies (Al-Yami and Price, 2006; Shafii, Ali and Othman, 2006; Hussin, Rahman and Memon, 2013; Olonade, 2015) have provided empirical evidences to support the fact that although climate change is one major concern, so also are the unsustainable use of natural resources, increasing scarcity of water, and the ever-increasing volume of waste.

In Nigeria, reports of incessant building collapse is an indicator that much is still needed in sustaining our construction activity; where buildings collapse and rubbles from the collapsed buildings are disposed off indiscriminately, posing a threat to the environment (Olonade, 2015). Dania *et al.*'s (2013) study revealed that Nigeria is lagging behind world developments associated with sustainability within the construction sector. This led to Abolore (2012) and Olonade (2015), among few studies in Nigeria, observing that unless drastic efforts are made to counter the negative practice of executing construction works in conventional ways which do not take sustainability into consideration and are not environmentally friendly, more harm than good will continue to come from our quest for infrastructural development. For this reason, the sure way to mitigate these destructive and damaging activities is to welcome the philosophy of sustainable construction.

The common perception about sustainable construction appears to be that it is costlier than ordinary construction (Al-Yami and Price, 2006) and this has been a major barrier to its implementation in construction activities (Isang, 2017). However, the benefits of sustainability practices are profound and therefore need to be disseminated to construction stakeholders in order for them to move their thinking from cost to value. Few studies (Abolore 2012; Dania *et al.* 2013 and Olonade, 2015) in Nigeria have focused on the issue of sustainability in construction. However, there is limited carefully designed scientific inquiry into the measures of improving the implementation of sustainability practices during the construction phase of building projects in Akwa Ibom State of Nigeria. Therefore, this study evaluates measures of improving the implementation of sustainability practices during construction phase of building projects. This is with a view to improving building construction projects performance and resource efficiency.

## REVIEW OF RELATED LITERATURE

Relevant literature identified education and training, government incentives, knowledge and awareness (Landman, 1999; Shafii, Ali and Othman, 2006; Abolore, 2012), the development, adoption and mobilization of sustainable building methods, tools, concepts, and the designers' competence with team work (Hakkinen and Belloni, 2011), regulations and change (Ochieng *et al.* 2014) as measures of improving sustainability practices. Specifically, Shafii, Ali and Othman (2006) observed that the construction industry has to adapt to sustainable construction by improving its implementation through: education and training; planning and construction initiatives through regulations, standards and incentives; adoption of integrated design approach; and development of tools to help in decision making. Similarly, Hakkinen and Belloni (2011) indicated that sustainability implementation on construction projects can be promoted by enacting relevant regulations by the authorities. The work of Abolore (2012) also highlighted the actions that can be taken to promote sustainability on construction sites to include: educating construction players and stakeholders through collaborative and

consultation works; support and incentives of the Government to prompt interest and encourage civic awareness among people to construct sustainably in the future. The work further advocated the use of conferences, seminars, training and workshops as a means of creating environmental awareness and civic consciousness among construction stakeholders to build sustainably.

In yet another study, Ochieng *et al.* (2014) emphasised the integration of sustainability principles into construction projects. This is believed to significantly manage the current environmental issue and attain significant improvements in the performance of project delivery. They, therefore, identified incentives and adequate regulations as measures to improve sustainable building construction. More importantly, the study of Hakkinson and Belloni (2011) suggested that the promotion of sustainability should include the development of the awareness of clients about the benefits of sustainable building construction; the adoption and mobilization of sustainable methods, tools, concepts, services and the designers' competence along with team work; the role of local building authorities in providing information which should be included in education and training programs at all levels; and the importance of increasing public awareness, knowledge and guidance about sustainability. Additionally, studies of Hussin, Rahman and Memon (2013) and Hakkinen and Belloni (2011) identified numerous advanced technological methods that have been developed to improve sustainability practices to include, lean techniques, industrialised building system, building information modelling, value engineering, and sustainable supply chain management (life-cycle assessment tools, energy consumption estimation methods, and service life prediction method).

While the above studies have helped, to an extent, in gaining an insight into the measures of improving sustainability practices in other climes, there are limited studies of this kind in some geographical locations in Nigeria. One of those locations is south-south, Nigeria. There is, therefore the need to conduct this kind of research in Akwa Ibom State of Nigeria in order to gain insights into the measures used to improve the implementation of sustainability practices during construction phase of building projects.

## METHODOLOGY

In evaluating the measures of improving the implementation of sustainability practices on building projects, a survey research design was used. This is followed by using mixed method for data collection involving quantitative and qualitative data. The study area covered all three senatorial districts of Akwa Ibom State comprising Uyo, Ikot Ekpene and Eket. The reason for selecting this study area was based on the numerous on-going construction activities being executed by both the public and private sector. The activities during building construction have been known to degrade the environment, consume excessive resources and emit carbons which are detrimental to public health. As such, there is need to evaluate measures of improving the implementation of sustainability practices on building projects in the study area. Respondents for the study were professionals who are directly involved in building construction which include: Builders, Architects, Engineers and Quantity Surveyors. This study population was chosen due to their active involvement in executing building projects and their knowledge of construction activities. Data collection was by questionnaire survey and interview. For the survey, the population was stratified on the basis of professional bodies involved in the study and proportional representation was applied to distribute the sample size of 383 respondents

among the various groups resulting in 80 valid responses. The qualitative aspect was conducted by interviewing ten seasoned building professionals consisting of three Builders, two Architects, two Engineers and three Quantity Surveyors, who were purposively selected from three building project sites based on their experiences, in order to gain further insight into measures that can be used to improve the implementation of sustainability practices in building projects. Data were analysed using the relative importance index (RII) to derive straightforward totals and rank the variables. RII was computed using the following formula:

$$RII = \frac{\sum W}{AN}$$

Where; W= weighting given to each factors by the respondents

A = the highest weight which is 5 (strongly agree)

N = total number of respondents

## RESULTS AND DISCUSSION OF FINDINGS

### Respondents' Characteristics

Respondents' characteristics were first analyzed. Table 1 shows that 66.3% of the respondents work for the public sector while the remaining 33.7% were in the employ of the private sector. The nature of building projects being executed by the respondents as indicated in the table shows that 33.8% of respondents executed residential buildings; 26.5% - commercial buildings; 21.3% - educational buildings and 18.4% industrial buildings. This result shows that majority of the projects executed in the study area are currently residential buildings, which may be due to an influx of people to Akwa Ibom State to seek greener pastures. Moreover, Table 1 reveals that 35% of the respondents were Engineers, 26% Quantity Surveyors, 21.3% Builders and 16.3% were Architects which implies that all the respondents are built environment professionals.

Additionally, the table indicates that majority of the respondents have adequate educational qualification to participate in the study with over 80% having a B.Sc. degree or above. Also indicated in Table 1 is that about 70% have professional affiliation with their regulatory professional bodies in the built environment, while about 30% are registered with other professional bodies including registration as project management professionals. This result generally indicates that the data provided by the respondents can be relied upon due to their professionalism and knowledge about the subject matter. In terms of respondents' years of experience, Table 1 further indicates that 55% of them have more than five (5) years experience, implying that majority of the respondents have adequate knowledge and experience about building projects to be able to participate in the survey.

Interviews were conducted in order to gain more insight from respondents on the measures of improving the implementation of sustainability practices. Background information of the interviewees is shown in Table 2. The details as revealed in Table 2 indicate that three are Builders, out of which two work in the public sector, while the remaining one works with a private enterprise. Also, three Quantity Surveyors were interviewed with two working in the private sector, while the remaining one works in the public sector. Furthermore, two Engineers and two Architects were interviewed with each of them working in the public sector. The range of years of experience of the interviewees is from six to 19 years. The least duration of the



interview was seven minutes, while the highest duration was 22 minutes. All the interviews were conducted by face to face method except one. Generally, the results imply that the interviewees had adequate qualification, knowledge and experience in making useful insights to the research.

**Table 1:** Details of respondents who participated in the survey

<b>Respondents' characteristics</b>	<b>Sub-characteristics</b>	<b>No.</b>	<b>Percentage (%)</b>
Work specialization	Public	57*	66.3
	Private	29*	33.7
	Total	86	100.0
Nature of building projects executed	Educational	29*	21.3
	Commercial	36*	26.5
	Industrial	25*	18.4
	Residential	46*	33.8
	Total	136	100.0
Designation	Builders	17	21.0
	Architects	13	16.0
	Engineers	28	35.0
	Quantity Surveyors	22	28.0
	Total	80	100.0
Qualification	OND	3	3.8
	HND	10	12.5
	B.Sc	52	65.0
	PGD	2	2.5
	M.Sc	10	12.5
	Ph.D	3	3.8
	Total	80	100.0
Affiliation	CORBON	11	13.8
	ARCON	11	13.7
	COREN	19	23.7
	QSRBN	14	17.5
	Others	25	31.3
	Total	80	100.0
Work Experience	0 – 5years	36	45.0
	6 – 10years	34	42.5
	11 – 15years	6	7.5
	Above 15years	4	5.0
	Total	80	100.0

\* Respondents ticked more than once, thus the total is more than 80 and 100 respectively

### Measures of Improving the Implementation of Sustainability Practices on Building Projects

Data collected on measures of improving the implementation of sustainability practices on building projects were analysed. The result of the analysis is presented in Table 3. The relative importance of all the identified measures of improving the implementation of sustainability practices during construction phase of building projects was evaluated. The result in Table 2 indicates that all the various groups (Builders, Engineers and Quantity Surveyors) except Architects ranked “education and training programmes for building professionals” as the most important measure of improving the implementation of sustainability practices during construction phase of building projects. Architects, however, ranked it second. Overall, it was

ranked first with an RII value of 0.950 (Table 3). Also, “competence and teamwork of professionals” ranked second by combining all the responses of the various groups together with an RII value of 0.922 and this was followed by “government regulations” which was ranked third by all the groups with an RII of 0.920. Further, “information by building authorities about sustainability” (RII of 0.904) and “development and mobilization of sustainable methods, tools and services” (RII of 0.882) were ranked by all the respondents as fourth and fifth respectively.

**Table 2:**Details of the respondents interviewed

S/N	Interviewee's designation	Interviewee's occupation	Duration of the interview (minutes)	Interview method	Years of experience (years)
Interviewee 1	Builder	Contractor (Public sector)	20	Face to face	17
Interviewee 2	Quantity Surveyor	Consultant (Private sector)	15	Face to face	10
Interviewee 3	Engineer	Consultant (Private sector)	17	Face to face	9
Interviewee 4	Architect	Contractor (Public sector)	22	Face to face	15
Interviewee 5	Quantity Surveyor	Contractor (Public sector)	14	Face to face	7
Interviewee 6	Builder	Contractor (Private sector)	21	Face to face	19
Interviewee 7	Engineer	Contractor (Public sector)	19	Face to face	8
Interviewee 8	Architect	Contractor (Private sector)	15	Face to face	6
Interviewee 9	Quantity Surveyor	Client (Private)	20	Face to face	11
Interviewee 10	Builder	Contractor (Public)	7	Phone	13

However, the “life cycle financial analysis of costs and benefits of sustainability” was ranked as the least important measures of improving the implementation of sustainability practices with an RII value of 0.810 (Table 3). Although, this measure is the least ranked by all the respondents combined together, the RII value is still very high indicating that it is also a very important measure that has to be reckoned with. This explanation goes to the other four measures that were ranked sixth to ninth, which are “clients' awareness” (RII of 0.850), “public awareness” (RII of 0.850), “incentives and initiatives” (RII of 0.848), and “adoption of an integrated design approach” (RII of 0.844).

### **Qualitative Interview on Measures of Improving the Implementation of Sustainability Practices on Building Projects**

Interviews were conducted for three projects selected as case study in order to gain further insight into the issues relating to the measures that can be taken to improve the implementation of sustainability practices during the construction phase of building projects. The first case study project was an on-going construction of a 600-seat capacity lecture theatre located at the University of Uyo main campus with the consultant being the Physical Planning Unit of the University. The second case study was the remodelling of a new four storey office complex at the Akwa Ibom State Civil Service secretariat annex by the Akwa Ibom State Government under the Ministry of Housing and Urban Renewal, while the third case study was the construction of a new library complex at the Akwa Ibom State College of Education, Afaha Nisit in Ikot Ekpene. Interviewees were asked to indicate the measures that can be used to improve sustainability practices on building projects once they indicated their understanding of what sustainability practices are. Interviewees 1, 2, 5, 6 and 9 believe that embedding sustainability practices in the building approval document, statutory backing by the Government and checking of building materials to see if they are sustainable would go a long way in improving the implementation of sustainability practices during construction phase of building projects. Additionally, interviewees 3, 4, 7, 8 and 10 suggested that stringent regulations by the Government is necessary, followed by adequate enforcement of the regulations put in place. They also added that sustainable construction methodology should be adopted during the construction phase of building projects. The complete measures listed by the interviewees are as follows:

- i Design, materials, products and specification submitted should be checked to ascertain if they are sustainable.
- ii Sustainability practices should be embedded in the conditions of contracts, programme of work and other essential documents, and these documents should act as a strong basis for approval of building projects by the Government.
- iii Stringent regulations by the Government combined with adequate enforcement.
- iv Sustainable methodology that takes into consideration the functional requirements of a building in terms of cost, time and quality should be adopted.

### **DISCUSSION OF RESULTS**

Findings from the questionnaire survey and interviews conducted are illuminating and profound. The result of the questionnaire survey indicates that “education and training programmes for building professionals” is the best measure of improving the implementation of sustainability practice. This result agrees with previous studies by Abolore (2012), Shafii, Ali and Othman (2006) and Landman (1999) that educating and training building professionals in sustainable concepts and methods are the most essential ways of ensuring sustainable construction is implemented on construction projects. This, therefore, attests to the fact that “education and training” has a role to play regarding the implementation of sustainability practices. Another illuminating finding from the questionnaire survey suggests that “competence and teamwork of professionals” has a role to play as a measure for improving the implementation of sustainability practices.

Table 3: Results of measures for improving sustainability practices on building projects

Measures	Builders			Architects			Engineers			Quantity Surveyors			Overall		
	N	RII	Rank	N	RII	Rank	N	RII	Rank	N	RII	Rank	N	RII	Rank
Education and training programmes for building professionals	17	0.930	1 <sup>st</sup>	13	0.938	2 <sup>nd</sup>	28	0.978	1 <sup>st</sup>	22	0.936	1 <sup>st</sup>	80	0.950	1 <sup>st</sup>
Competence and teamwork of professionals	17	0.930	1 <sup>st</sup>	13	0.984	1 <sup>st</sup>	28	0.908	5 <sup>th</sup>	22	0.900	3 <sup>rd</sup>	80	0.922	2 <sup>nd</sup>
Government regulations	17	0.894	3 <sup>rd</sup>	13	0.924	4 <sup>th</sup>	28	0.922	4 <sup>th</sup>	22	0.936	1 <sup>st</sup>	80	0.920	3 <sup>rd</sup>
Information by building authorities about sustainability	17	0.882	5 <sup>th</sup>	13	0.876	7 <sup>th</sup>	28	0.936	2 <sup>nd</sup>	22	0.900	3 <sup>rd</sup>	80	0.904	4 <sup>th</sup>
Development and mobilization of sustainable methods, tools and services	17	0.894	3 <sup>rd</sup>	13	0.754	9 <sup>th</sup>	28	0.928	3 <sup>rd</sup>	22	0.890	5 <sup>th</sup>	80	0.882	5 <sup>th</sup>
Clients' awareness	17	0.824	6 <sup>th</sup>	13	0.924	4 <sup>th</sup>	28	0.814	10 <sup>th</sup>	22	0.872	7 <sup>th</sup>	80	0.850	6 <sup>th</sup>
Public awareness	17	0.800	8 <sup>th</sup>	13	0.938	2 <sup>nd</sup>	28	0.836	9 <sup>th</sup>	22	0.854	8 <sup>th</sup>	80	0.850	6 <sup>th</sup>
Incentives and initiatives	17	0.776	9 <sup>th</sup>	13	0.784	8 <sup>th</sup>	28	0.886	6 <sup>th</sup>	22	0.890	5 <sup>th</sup>	80	0.848	8 <sup>th</sup>
Adoption of an integrated design approach	17	0.812	7 <sup>th</sup>	13	0.892	6 <sup>th</sup>	28	0.842	8 <sup>th</sup>	22	0.846	9 <sup>th</sup>	80	0.844	9 <sup>th</sup>
Life cycle financial analysis of costs and benefits of sustainability	17	0.718	10 <sup>th</sup>	13	0.754	9 <sup>th</sup>	28	0.864	7 <sup>th</sup>	22	0.846	9 <sup>th</sup>	80	0.810	10 <sup>th</sup>

N = Number of Respondents; RII = Relative Importance Index

This, again, supports the assertion of Hakkinson and Belloni (2011) that the promotion of sustainability should include competence along with team work. Importantly, this study sees “government regulations” as one of the measures capable of improving the implementation of sustainability practices during the construction phase of building projects and this is supported by the work of Ochieng *et al.* (2014) that regulations by the Government is the success criteria to move towards sustainable building construction. It is worthy of note that “life cycle financial analysis of cost and benefits of sustainability” was the least ranked measure of improving sustainability practices. That notwithstanding, the measure is still regarded as one of the very important measures of improving sustainability practices implementation due to high value of RII of 0.810. This observation is consistent with Landman (1999) that conducting life cycle financial analysis of cost and benefits is one of the best measures for sustainable construction projects. In addition to the outcomes of the questionnaire survey, the interviews conducted added some insights into the measures of improving the implementation of sustainability practices during construction phase of building projects. Some of the illuminating findings are that the design, materials, products and specification submitted should be checked for sustainability. This, by implication, means that there is the need to have a system on ground to ensure that the design, materials, products and specifications are conformable to sustainability provisions. This result is consistent with one of the measures from the questionnaire survey (adoption of an integrated design approach). Additionally, the interviews revealed that embedding sustainability practices in the conditions of contract including programme of work and other essential contract documents would go a long way in improving the implementation of sustainability practices on building projects.

## CONCLUSIONS

The survey evaluated measures that can be used to improve the implementation of sustainability practices on building projects in Akwa Ibom State, Nigeria. The study, based on triangulation of research methods, concluded that “education and training programmes for building professionals”, “competence and teamwork of professionals”, “stringent regulations by the Government”, “checking the design, materials, products and specification submitted to ascertain if they are sustainable”, “embedding sustainability practices in the building approval document as well as the document acting as a strong basis for approval of building projects by the Government, also, the existence of statutory backing by Government through provision of laws” would go a long way in improving the implementation of sustainability practices in the study area. As there is no standard in Nigeria to regulate the implementation of sustainability practices on building projects, the study has contributed to knowledge by providing a number of measures that can be used to improve the implementation of sustainability practices during the construction phase of building projects. The study recommends that improving the knowledge of building professionals as well as stringent regulations on sustainability by the government through adequate enforcement would improve the implementation of sustainability practices on building construction projects. Public awareness to increase civic consciousness on the benefits of sustainability practices is also recommended to improve its implementation on building projects.



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